APPARATUS FOR DELIVERING AND STACKING FOLDED SHEET MATERIAL

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Applicant:	SPICERS STATIONERY LTD
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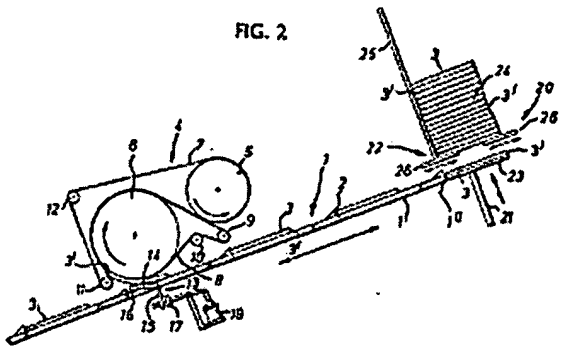
Abstract of **GB1396138**

1396138 Conveying and stacking folded sheets &c. SPICERS (STATIONERY) Ltd 30 Oct 1973 [3 Nov 1972] 50676/72 Heading B8A Folded sheets, signatures or books without stiff covers are conveyed by a reciprocating transport table and stacked from below by a lifting member co-operating with a stack support. In order that the stack be stable, selected articles or groups of articles are reversed by a book reversing device above the transport table. In the figure, books 3 are conveyed by reciprocating table 1. Abutments 2 on the longitudinal edges of table 1 are depressed as a book moves forwards over them but stop the book from sliding back as the table moves backwords. Books to be reversed are lifted by arm 14 of bell crank lever 13, which is operated by solenoid 18 via linkage 19 and pressure bar 17. The book is gripped between endless belts 7 and 8 and delivered to the table 1 again with the spine 3<SP>1</SP> facing the opposite direction from before.

FIG. 2



PATENT SPECIFICATION 1 396 138

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B8A 12C

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(54) APPARATUS FOR DELIVERING AND STACKING FOLDED SHEET MATERIAL

(71) We, SPICERS (STATIONERY) LIMITED, of Sawston, Cambridge, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus for delivering and stacking folded sheet material, wherein predetermined numbers of said material are delivered in alternate positional orientation into a pile or stack for the ease of handling and packing of said material.

The term "folded sheet material" used herein is intended to denote not only individual folded sheets of flexible material or groups of sheets, but also signatures and finished books other than books having stiff covers. For the sake of brevity such material will hereinafter shortly be referred to as "books".

Hitherto such books have been delivered in one positional orientation, that is with the fold or spine of the book leading or trailing, into a stream delivery by means of a reciprocable transport table, which necessitated the gathering and stacking of the books in alternate positional orientation to be carried out by hand.

The present invention aims at dispensing with the manual gathering operation and at mechanising the stacking of the books in order to form a squared-up, stable pack.

To this end the present invention consists in an apparatus for delivering and stacking books (as herein defined), comprising an elongate transport table reciprocable in its longitudinal direction for moving said books seriatim from one end of said table to the other end, a stacking device arranged at said other end of the transport table and including a book lifting means, reciprocable at right angles to the plane of said transport table, a stack supporting means arranged above said book lifting means and in alignment therewith, and a book reversing device arranged adjacent said one end of the transport table for selectively reversing the positional orientation of a predetermined number of said books transported by said table.

Advantageously, the book reversing device comprises two oppositely driven pulleys arranged in a plane above said transport table with their axes of rotation parallel and horizontal, each said pulley serving to drive an endless belt, the two belts cooperating with one another over a portion of their length to transport between them a book picked up from said transport table and to reverse its positional orientation relative to said table. Conveniently, in order to feed the book between the belts, means are provided for lifting an edge of the book from the transport table so as to cause the book to be engaged between the belts. This may be effected by means of two arms each pivotally mounted on either side of the transport table and actuable via a pressure bar by means of a solenoid.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example one embodiment thereof, and in which:—

Fig. 1 shows a general view of the apparatus in accordance with the invention with a book by-passing the book reversing device, and

Fig. 2 is a similar view of the apparatus with a book entering the book reversing device.

Referring to the drawings, the apparatus comprises an elongate transport table 1 which is inclined to the horizontal at an angle of approximately 18° and which is driven to reciprocate in its longitudinal direction. The transport table 1 is provided

[Price 33p]

on its longitudinal edges 1′ with longitudinally spaced apart abutment members 2 arranged in pairs which are resiliently pivotally mounted so as to yield downwardly when books 3 placed on the table 1 are advanced over the abutment members 2 by the reciprocating motion of the transport table 1. The latter thus effects an intermittent pushing action on the books 3 which are caused to advance from one space between two adjacent pairs of the abutment members 2 to the next in the direction of the top end of the transport table 1.

Above the transport table 1 intermediate its ends there is arranged a book reversing device 4, which serves selectively to reverse the positional orientation of a predetermined number of the books 3 conveyed by the table 1. The reversing device 4 comprises two oppositely driven belt pulleys 5 and 6 which are mounted in side frames (not shown) one behind the other in a plane and with their axes of rotation horizontal and in spaced parallel relationship. The pulleys 5 and 6 respectively serve to drive endless belts 7 and 8 which are further supported by one or more smaller guide pulleys and preferably a jockey pulley also mounted in said frames. The leading drive pulley 5 is of smaller diameter than that of the trailing drive pulley 6 and is spaced from the transport table 1 a greater distance than the larger drive pulley 6.

The endless belt 8 associated with the trailing drive pulley 6 has one guide pulley 9 and one jockey pulley 10 which are disposed one behind the other closely below the leading drive pulley 5 in the space between the latter and the transport table 1. The endless belt 7 associated with the leading drive pulley 5 has two guide pulleys 11, 12, one disposed closely behind the trailing pulley 6 and adjacent the transport table 1 and the other disposed above and behind the trailing drive pulley 6. By virtue of such arrangement of the drive and guide pulleys the belt 7 driven by the leading drive pulley 5 can be looped around the upper and rear part of the trailing drive pulley 6 so as to be in close contact with the other belt 8 over approximately half the circumference of the trailing drive pulley 6 and over a distance substantially corresponding to a straight portion of the other belt 8 between the trailing drive pulley 6 and the associated guide pulley 9 below the leading drive pulley 5.

Attached to each side of the transport table 1 immediately below the trailing drive pulley 6 is a bell-crank lever 13, the arm 14 of which in the rest of inoperative position of the lever 13 (Fig. 1) extends parallel with the respective side of the table 1, the other arm 15 extending downwardly below the table 1. The free end of the upper arm 14 of each of the levers 13 is provided with a roller 16, the free end of the lower arm 15 being adapted to be acted on by a pressure bar 17, actuated by a solenoid 18 via an appropriate linkage 19, so as to cause the lever 13 to pivot and raise the upper arm 14 towards the trailing drive pulley 6. If the positional orientation of a book situated at a given time on the transport table 1 immediately below the trailing drive pulley 6 is to be reversed, for example from the spine 3′ of the book 3 trailing to the spine of the book leading (Fig. 2), the solenoid 18 is energised, whereby the spine portion 3′ of the book 3 is raised by the upper arm 14 of the lever 13 and engaged by the two moving superposed belts 7 and 8 to be carried upwards over the circumference of the trailing drive pulley 6 and then downwards towards the leading drive pulley 5 when at the point where the two belts 7 and 8 separate the book 3 is released and drops back on to the transport table 1 with its position reversed, i.e. with the spine 3′ of the book leading. Depending on the thickness of the books 3 the position of a predetermined number thereof may thus be reversed in succession by corresponding energisation of the solenoid 18 which number may then be followed by the same number of unreversed books when the solenoid 18 remains de-energised.

When the pressure bar 16 is at rest (Fig. 1), the bell-crank levers 13 remain in their normal rest position (Fig. 1) whilst being carried to and fro by the transport table 1. This allows the books 3 to by-pass the reversing pulleys 5 and 6 and to be delivered without reversing. The feeding of the book 3 to the reversing pulleys 5 and 6 takes place whilst the transport table 1 commences its backward stroke (to the left as viewed in the drawings), while the book is deposited back into a gap on the transport table 1 on completion of the return forward stroke of the transport table 1.

Adjacent the upper end 1″ of the transport table 1 there is arranged a stacking device 20 which includes a book lifting means 21 reciprocable at right angles to the direction of movement of the transport table 1 and a stack supporting means 22 arranged above the book lifting means 21 and in alignment therewith. The book lifting means 21 is constituted by a pronged table 23 disposed in a plane parallel with that of the transport table 1 and raisable and lowerable in timed relationship with the transport table 1 by means of an appropriate cam drive (not shown). The pronged table 23 serves to receive a book 3 from the transport table 1 and to lift it

into a stack 24 carried by the stack supporting means 22. The latter is constituted by an upwardly extending stationary stay 25 and two sets of pronged carrying bars 26 reciprocable parallel to the plane of the transport table 1 which move away and towards each other in timed relationship with the lifting table 23 so as to form an aperture in the bottom support of the stack 24 for the introduction therein of a book from below. As the transport table 1 commences its backward stroke, having delivered a book 3 on to the lifting table 23, the carrying bars 26 begin to move apart and at the same time the lifting table 23 is raised. The book is carried by the table 23 between the open bars 26 which close again, i.e. move towards each other, when the table 23 reaches the top of its stroke. As the lifting table 23 is lowered, the prongs of the table 23 pass between the prongs on the carrying bars 26 leaving the book supported on the bars 26. This operation is repeated continuously and the following book is delivered below the first book thereby forming a neat stack with the books arranged in alternate positional orientation.

WHAT WE CLAIM IS:

1. An apparatus for delivering and stacking books (as herein defined), comprising an elongate transport table reciprocable in its longitudinal direction for moving said books seriatim from one end of said table to the other end, a stacking device arranged at said other end of the transport table and including a book lifting means, reciprocable at right angles to the plane of said transport table, a stack supporting means arranged above said book lifting means and in alignment therewith, and a book reversing device arranged adjacent said one end of the transport table for selectively reversing the positional orientation of a predetermined number of said books transported by said table.

2. An apparatus as claimed in claim 1, wherein the book reversing device comprises two oppositely driven pulleys arranged in a plane above said transport table with their axes of rotation parallel and horizontal, each said pulley serving to drive an endless belt, the two belts co-operating with one another over a portion of their length to transport between them a book picked from said transport table and to reverse its previous positional orientation relative to said table.

3. An apparatus as claimed in claim 2, wherein in order to feed the book between the belts, means are provided for lifting an edge of the book from the transport table so as to cause the book to be engaged between the belts.

4. An apparatus as claimed in claim 3, wherein the edge lifting means comprise two arms each pivotally mounted on the respective side of the transport table and actuable via a pressure bar by means of a solenoid.

5. An apparatus as claimed in any one of the preceding claims, wherein the book lifting means comprises a pronged table which is reciprocable by means of a cam drive.

6. An apparatus as claimed in any one of the preceding claims, wherein the sack supporting means comprises an upwardly extending stationary stay and two sets of pronged support bars at the bottom end of said stay, said support bars being reciprocable away and towards each other parallel to the plane of the transport table.

7. An apparatus for delivering and stacking books (as herein defined), substantially as herein described with reference to and as shown in the accompanying drawings.

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1,396,138 COMPLETE SPECIFICATION
2 SHEETS

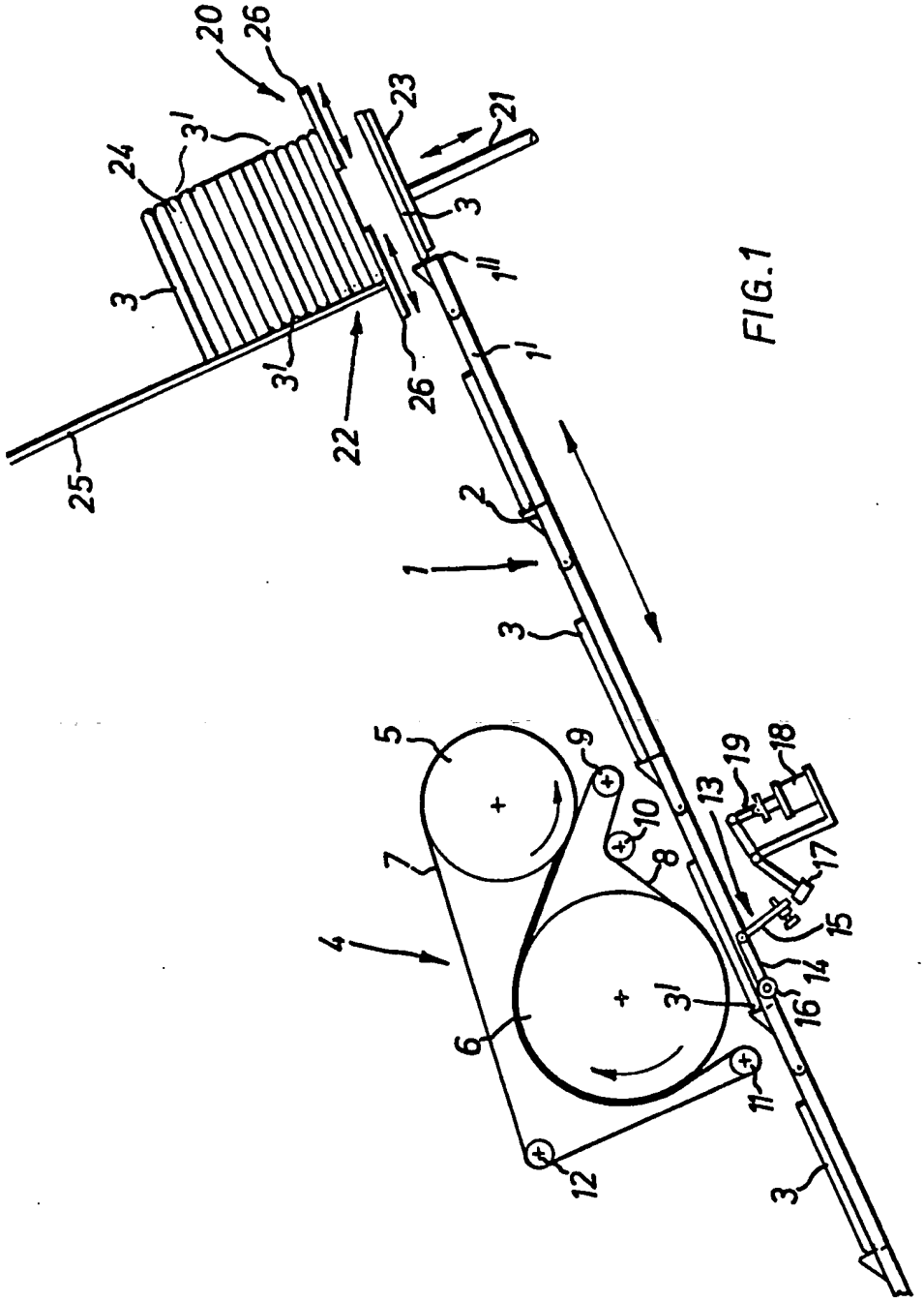

FIG.1

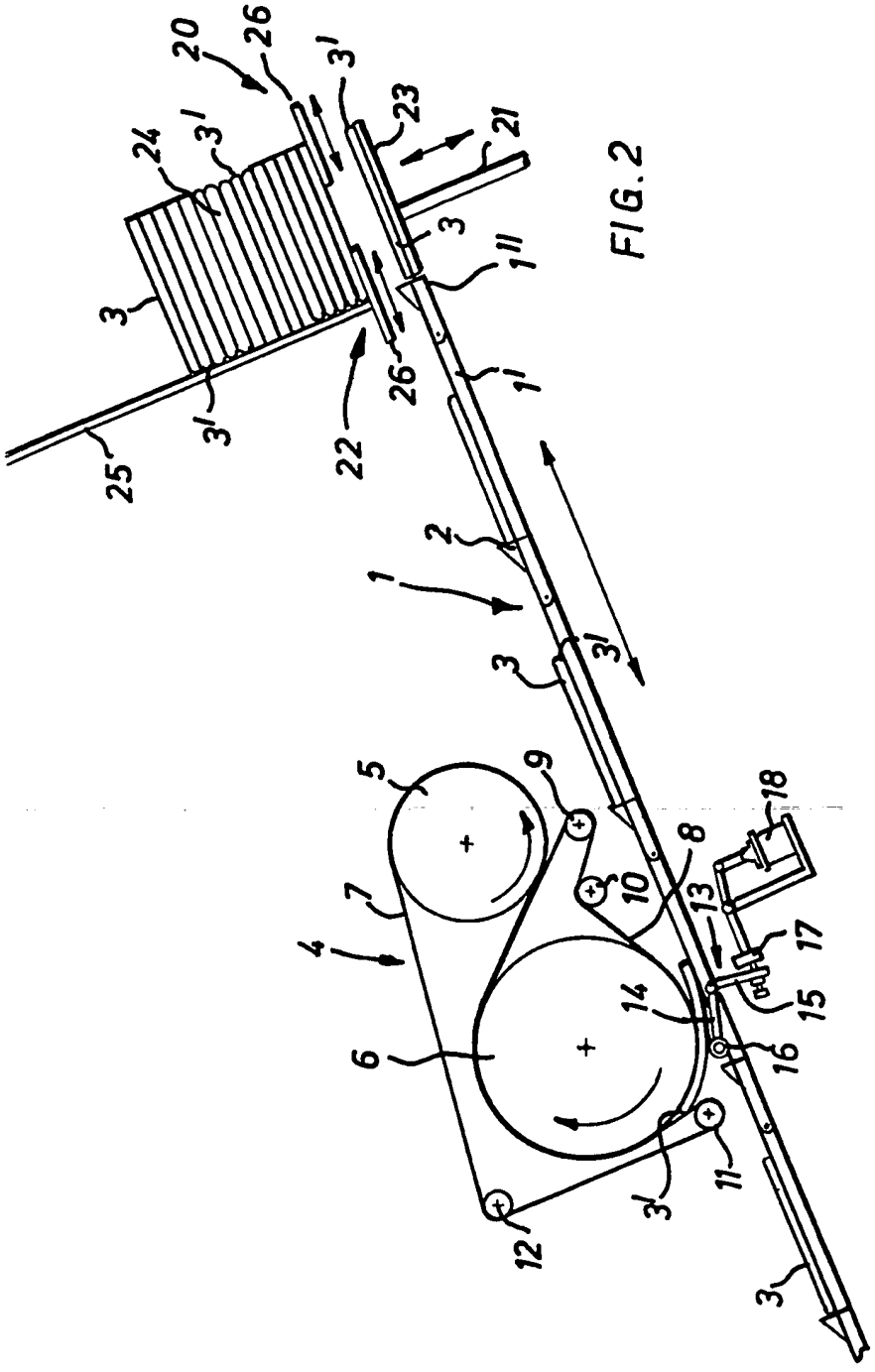
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FIG. 2